

## THE EFFECT OF FERTEC-TYPE LIQUID FERTILIZERS ON THE ECOLOGICAL PROTECTION OF THE ENVIRONMENT

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Received November 2, 2009

**ABSTRACT** – In this scientific paper, we have shown the apparent degrees of the efficient use of nutrients from leaf fertilizers ( $\text{GAUPEN}_{\text{ICF}}$ ) and the productive degrees of the efficient use of nutrients from soil reserves ( $\text{GUPEN}_{\text{sol}}$ ), based on greenhouse tomato yields, obtained after applying leaf fertilizers. In our trials, we have tested the fertilization method and leaf compositions as methods of plant fertilization, for correcting and supplementing crop nutrition in greenhouses and preventing environment pollution. By applying leaf fertilizers in greenhouse tomato crops, we have obtained high yield increases and a significant diminution in the chemical pollution of the environment. The incomplete use by the crop of nutrients from applied fertilizers has determined the increase in the incidence of soil chemical pollution. However, soil fertility may be diminished by high uptakes of soil nutrients, under conditions of weak nutrient supply of soil (without basic fertilization). Therefore, we recommended

the concomitant use of soil and leaf fertilization.

**Key words:** ecological protection, environment, tomatoes, liquid fertilizers

**REZUMAT** - Efectul fertilizării cu îngrășăminte lichide tip Fertec asupra mediului ambiant. Lucrarea prezintă gradele aparente de utilizare productivă a elementelor nutritive din îngrășămintele foliare aplicate ( $\text{GAUPEN}_{\text{ICF}}$ ) și gradele de utilizare productivă a elementelor nutritive din rezervele solului ( $\text{GUPEN}_{\text{sol}}$ ), pe baza recoltelor obținute în sere, la o cultură de tomate, ca urmare a aplicării fertilizării foliare. În cercetările noastre, au fost testate metoda de fertilizare experimentată și compozițiile foliare cercetate, ca fiind metode și mijloace de fertilizare a plantelor, destinate corectării și suplimentării nutriției culturilor în sere și prevenirii poluării mediului ambiant al producției vegetale. Din punct de vedere practic, prin utilizarea

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metodei de fertilizare foliară și prin aplicarea de fertilizanți foliari la cultura de tomate în sere, se obțin, pe lângă sporuri importante de producție, și efecte însemnate de reducere a fenomenului de poluare chimică a mediului ambiant. Utilizarea productivă incompletă în recoltă a nutrienților din îngrășămintele aplicate determină, astfel, creșterea incidenței fenomenului de poluare chimică a solului. Totuși, prin consumurile mari de nutrienți din sol, prin utilizarea fertilizării foliare, în condițiile unor soluri slab aprovizionate cu nutrienți (fără fertilizare de bază în sol), se poate reduce fertilitatea solului. De aceea, se recomandă utilizarea concomitentă a fertilizării în sol și a fertilizării foliare.

**Cuvinte cheie:** protecție ecologică, mediu, îngrășămintele lichide

## INTRODUCTION

The chemical pollution of the environment by nutrients and accompanying ions may also occur when soil is fertilized scientifically, due to some phenomena, like adsorption, fixation of nutritive ions on soil colloids and leaching ( $\text{NO}_3^-$ ,  $\text{Cl}^-$ ), which contribute to the diminution in the levels of efficient use of nutrients (Dana *et al.*, 2003).

In fact, by classical soil fertilization methods, the highest levels of annual use of crop nutrients are 60-80% in case of nitrogen, 15-20% in case of phosphorus and 70-75% for potassium salts. The incomplete use of nutrients from applied fertilizers determines the increase in the incidence of chemical pollution of the environment (Anton *et al.*, 2007, 2008, 2009).

By applying leaf fertilizers in greenhouse tomato crops, we have obtained high yield increases and a significant diminution in the chemical pollution of the environment. However, soil fertility may be diminished by high uptake of nutrients from soil, under conditions of weak nutrient supply of soil (without base fertilization). Therefore, we recommended the concomitant use of soil and leaf fertilization, the best ratio between base fertilization and leaf fertilization being of 9:1 (Dorneanu *et al.*, 2003).

## MATERIALS AND METHODS

Experimental testing of liquid fertilizers with ecological characteristics was carried out at SERE Joint-Stock Company of Codlea, Brașov County. Our goal was the greenhouse crop fertilization in the period from seed planting to plant physiological maturity. The chemical composition of this fertilizer type is shown in *Table 1*.

The biological material used for testing the liquid fertilizers (Fertec B and Fertec K), made at the National Research and Development Institute for Soil Science, Agrochemistry and Environmental Protection - the Research Institute for Soil Science and Agrochemistry, was the Shirley Variety of tomato (2007).

Experiments were conducted in greenhouse plots of 200 m<sup>2</sup>, 50 m<sup>2</sup> each.

Soil was fertilized with 100 tonnes / ha fermented manure, while during vegetation, 100 kg / ha potassium monophosphate (0-52-34) and 40 kg / ha magnesium sulphate (16.2 % MgO) were incorporated into soil. Leaf fertilizers were applied in four treatments during the

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growing season, at rates of 0.5%. The dilute solution used for a single treatment was of 2000 l / ha. These applications

were done during May- July, every 3 - 4 weeks.

**Table 1- Chemical composition of liquid fertilizers with ecological features, made and tested at NRDISSAEM - RISSA\***

Components	M.U.	Fertilizer types	
		Fertec-B	Fertec-K
N	g/l	30	30
P <sub>2</sub> O <sub>5</sub>	g/l	30	30
K <sub>2</sub> O	g/l	30	30
Mg	g/l	0.5	0.5
S	g/l	3.6	3.6
Plant extract with amino acids and auxines	ml/l	80	-
Sea algae extract with auxines and kinetin	ml/l	-	80
Density	g/cm <sup>3</sup>	1.109	1.105

\*NRDISSAEM - RISSA = National Research and Development Institute for Soil Science, Agrochemistry and Environmental Protection- Research Institute for Soil Science and Agrochemistry

## RESULTS AND DISCUSSION

Tables 2 and 3 showed the apparent degrees of the efficient use by the crop of nutrients from leaf fertilizers (GAUPEN<sub>ICF</sub>) and the productive degrees of the efficient use of nutrients from soil reserves (GUPEN<sub>sol</sub>), based on greenhouse tomato production, obtained after applying leaf fertilization.

Analyzing obtained data, we have found that the apparent degrees of the efficient use by crops of nutrients for leaf treatments (GAUPEN<sub>ICF</sub>) showed values of hundreds and even thousands, compared to the unfertilized control. Therefore, leaf treatments had an intense effect of physiological

stimulation in plants, involved an additional uptake of nutrients from soil reserves and applied fertilizers.

The apparent degrees of the efficient use by crops of nutrients from leaf treatments have shown an increase proportional to yield increases, having high values if the nutrient uptake from leaf treatment was low. The high levels of the efficient productive use of nutrients from leaf treatments were determined by the large export of nutrients with yield increases and the low intake of nutrients from applied leaf fertilizers (kilos for macronutrients) (Table 2).

Table 2 - The apparent degrees of productive use of nutrients from liquid fertilizers with ecological features (GAUPEN<sub>ICF</sub>, %) in greenhouse tomato crop (Shirley Variety), second cycle, grown at SERE Joint-Stock Company of Codlea, Braşov County, in the third year, 2007

Variant	Fertilizer type	No. treatments	Solution concentration [%]	Quantity of used fertilizers [litres/ha]		Fruit production [t/ha]	Yield increase [t/ha]	GAUPEN <sub>ICF</sub> , %		
				For one treatment	For all treatments			N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
1	Unfertilized leaf treatment	-	-	-	-	60.4	-	-	-	-
2	Fertec B leaf treatment	4	0.5	10.0	40.0	75.8	15.4	6802	1797	8983
3	Fertec K leaf treatment	4	0.5	10.0	40.0	76.6	16.2	7155	1890	9450

Table 3 – Degrees of efficient use of nutrients from soil (GUPEN<sub>sol</sub>, %) in greenhouse tomato crop (Shirley Variety), second cycle, grown at SERE Joint-Stock Company of Codlea, Braşov County, in the third year, 2007

Variant	Fertilizer type	No. treatments	Solution concentration [%]	Quantity of used fertilizers [litres/ha]		Fruit production [t/ha]	Yield increase [t/ha]	GUPEN <sub>sol</sub> , %		
				For one treatment	For all treatments			N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
1	Unfertilized leaf treatment	-	-	-	-	60.4	-	-	-	-
2	Fertec B leaf treatment	4	0.5	10.0	40.0	75.8	15.4	125	124	125
3	Fertec K leaf treatment	4	0.5	10.0	40.0	76.6	16.2	126	125	127

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In addition, the degrees of productive use of nutrients from soil (GUPENsol) have shown higher values than 100 in all the variants of leaf treatment. This pointed out the effect of stimulating plant root nutrition provided by leaf treatments (*Table 3*).

The degrees of the efficient productive use of soil nutrients (GUPENsol), recorded in variants fertilized with leaf compositions, had higher values than the unfertilized control, showing the superiority of these fertilization methods and preventing the chemical pollution of the environment.

## CONCLUSIONS

The use of the method of leaf fertilization and the application of leaf fertilizers in greenhouse tomato crop determine great yield increases and significant effects of reducing the chemical pollution of the environment.

The incomplete use by crops of nutrients from fertilizers increases the incidence of soil chemical pollution.

High nutrient uptake from soil, by using leaf fertilization, under conditions of weak nutrient supply of soil (without base fertilization in soil) may contribute to diminish the soil fertility. Therefore, we recommend the concomitant use of soil fertilization and leaf fertilization.

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